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# VOLUMINOUS FLAT FORMED BODY FOR PADDING UNDER DECORATIVE LAYERS
[VOLUMINÖSES FLÄCHENGEBILDE ZUR UNTERPOLSTERUNG VON DEKORSCHICHTEN]

Anonymity Requested

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Description

The present invention relates to voluminous flat formed bodies for padding under decorative layers. Layers of this type for padding can be found, e.g., in the residential area, especially among textile wallpapers in order to emphasize the voluminous structure of the decorative material and to improve heat insulation, in upholstered furniture as a base under the furniture fabric, for example in order to design the lateral arm rests areas so that they are somewhat more voluminous, and in the passenger car and truck areas for padding under the seat fabric and the paneling materials in the interior area especially of door panels, instrument panels in the headliner area and in the floor area.

Depending on the requirements, the decorative materials used usually involve substrates from the textiles group, e.g., woven fabric (also auto seat cover materials), knitted fabric, spun fabric or nonwovens or from the group of foils or leatherette or from the leather group. Decorative materials of this type are used to design the surfaces of objects like walls, upholstered furniture or vehicle interior appointments so that they are attractive. However, since this usually involves more or less flat and/or two-dimensionally formed objects, frequently there

is the need to structure the decorative layer so that it is somewhat more voluminous and also providing a hard substrate with the named decorative layers can be unattractive and/or have an unpleasant feel when touched.

Using so-called welded pads for such a purpose is known, which usually consist of a foam that is needled with fibers that are advantageous for high frequency welding or possibly with a heavy cotton fiber. The decorative layer is welded to the welded pad by means of the high-frequency technique. However, this technique causes polymers with dipole characteristics, which means that at least a part of the decorative layer must contain PVC or other polymers containing halogen or pseudohalogen. Because of the environmental discussion around polymers containing halogen, this technique is hardly used any longer today.

A padding that has been used frequently to date is a thin, e.g., 2-8 mm thick, foam. The advantage of the foam padding is undoubtedly the low price, the pleasant softness, which can be adjusted precisely, as well as the excellent dynamic recovery rate even after repeated stress.

This foam was preferably connected to the decorative material using flame lamination. To do this, a 0.2 to 1 mm thick foam is used as an adhesive, in that it is liquefied

using a gas flame and glues the decorative layer and the foam padding layer together. This method has been criticized due to the toxic gases that develop during flame treatment of the foam and today has frequently been replaced by more environmentally-friendly lamination methods.

Another serious disadvantage of the foam is the inadequate low-flammability in its raw state according to the low-flammability standard MVSS 302 required, for example, in the automotive area. The level of low-flammability can only be achieved by the addition of flameproofing chemicals. However, this increases the so-called fogging effect that is not inconsiderable with foam in any case, e.g. the deposition of volatile substances from plastics on the windows, and not just in new vehicles. Fogging is not only unpleasant since it forms a milky film on the vehicle windows, it also has a negative effect on traffic safety since at night, blinding effects and reflections occur due to the lights of oncoming vehicles.

Another problem that can occur with foams is the poor aging resistance. With increasing vehicle service life, foams can age because of the frequent cold/hot alternating stress in connection with greatly changing humidity and be damaged before the end of the vehicle service life.

For this reason, for some time an attempt has been made to find alternatives to foam padding.

The use of purely needled nonwovens is common, which can consist of homopolymeric synthetic fibers or reprocessed materials and if necessary can be needled on substrates like waste material or spun nonwovens. Nonwovens of this type have the disadvantage that to achieve the required dynamic recovery rate an increased basis weight is necessary since the required characteristic of good dynamic recovery rate even after repeated stress can only be achieved with the use of high-density materials, i.e., by a high basis weight in relationship to the material thickness. However, an increase of the density causes the negative effect that the required softness comparable to foam cannot be achieved.

EP 763418 (Daimler Benz) describes a method for manufacturing a multi-layer web of upper material and a nonwoven lying below it. The nonwoven mentioned in this document must be a nonwoven with a high percentage of standing fibers, which will additionally be stabilized with binding fibers. Dilution-forming processes or even stitch-bonding processes, or the so-called struto process are mentioned as manufacturing methods for the nonwoven. The pre-reinforced nonwoven containing binding fibers is

treated thermally in a thermofusion zone and calibrated using guide bands with narrowing spacing. Then a lamination with the decorative material takes place on the same line.

In the patent, no further details are given on the type of binding fibers, nor in more detail on the type of substrate fibers. Only the use of "a bicomponent binding fiber with two thermoplastics with different melting points, e.g., 140°C and 220°, in concentric arrangement with the lower-melting plastic lying on the outside." In the case of the substrate fibers, the usability of torn fibers or the use of polyester fibers of specific fiber dimensions is mentioned, whereby it has to be assumed that it is a case of fibers with a common and widely usable two-dimensional crimping structure.

Needled or knitted nonwovens of fiber mixtures of this type usually have various disadvantages, which makes their use for pads for parts with difficult contours or shapes questionable. This means that nonwovens of this type tend to bend around sharp edges and/or form folds during three-dimensional shaping, which has a negative effect, even through the decorative material and the visual appearance of the surface is negatively influenced in an unacceptable manner.

This can be explained by a strong fusing of the

amorphous melting shroud of the bicomponent fiber, whereby the relative fiber movement in the nonwoven is greatly restricted.

A behavior such as this is designated as "rolling behavior." A corresponding test is carried out in that the two ends of the sample are placed together in a U shape without a fold. Then the ends are slid parallel, but in opposite directions so that a movement results at the bending point. What is evaluated is whether the movement is smooth and round (clean rolling) or whether folding appears.

The use of these conventional fibers also requires the use of an elevated basis weight since the required characteristic of good dynamic recovery rate, even after repeated stress, can only be achieved with these types of fiber if high-density materials are used, i.e., in a ratio of high basis weight in relationship to material thickness. This results in a second disadvantage of these types of material in comparison to foams, namely that a relatively hard product results which is acceptable in an emergency but requires improvement. The high basis weights of these materials in connection with the relatively slow manufacturing methods including dilution-forming, stitch-bonding or the so-called struto process mentioned above,

also cause high prices for articles of this type.

The higher basis weight mentioned also limits the goal of the vehicle engineers to lower the fuel consumption through weight savings.

The padding material according to the invention does not have these disadvantages. In this case, the bending properties including surface smoothness, good softness, good dynamic recovery rate, even after repeated stress, good rolling behavior (no fold formation as a result), good rebound elasticity, low density, low weight and low price are combined in an ideal way.

In addition, the padding material according to the invention offers the advantages of extremely low fogging tendency, as well as fulfillment of the low-flammability standard MVSS 302 without any flame-proofing additives.

The padding material according to the invention is manufactured using the needled nonwoven method, as is described, for example, in the book "Nonwovens" by the author "Lünenschloß," Georg Thieme Verlag Stuttgart, on pages 67 to 103 and 122 to 142 and is subjected to a temperature treatment as described on pages 215 ff of the same book.

The padding material according to the invention consists mainly of polyester fibers that have the

characteristic of shrinking due to the effect of heat and forming a spiral-crimped in the process. Bicomponent fibers of the side-by-side type, for example, are suitable for this. They have the characteristic of having a lower crimping intensity in as-delivered condition or having a different crimping characteristic than after a heat treatment that is integrated in the process. Fibers of this type can be obtained, for example, under the designation "Tergal X 403" from the Rhone Poulenc Company and consist of a side-by-side bicomponent structure of polyethylene glycol terephthalate in one half and polybutylene glycol terephthalate in the other half. The two halves of the fibers shrink differently under the effect of heat, similarly to a bimetallic and thus form a denser three-dimensionally crimped structure. In this type of fiber, the number of crimps can change from an original 10-13 crimps/inch to 50-70 crimps/inch after the heat treatment. Shrinkage is naturally a consequence, as is the compression of the nonwoven connected with it. A shrinkage of the nonwoven of this type causes a homogenizing of the surface pattern, since the thin areas caused by the nonwoven manufacturing and needling process can be reduced by the contraction caused by the shrinkage of the nonwoven.

Fibers of this type can also have a traditional two-

dimensional crimp in the original state, whereby the spiral-crimped does not form until after the heat treatment described.

Fibers that form a spiral-crimped after thermal treatment even without the named bicomponent structure are suitable.

Because of the use of the named fiber, the rolling behavior of the nonwoven is significantly improved. This could be explained in that, due to the shrinkage and the three-dimensional crimp, the fibers are aligned in the nonwoven and do not result in a preferential direction, usually in carding direction, as with the two-dimensionally crimped fibers mentioned. Because of this, the padding material according to the invention exhibits a rather isotropic rolling behavior causes a condition in which no more folds develop.

Spiral-crimped fibers in the nonwoven additionally cause it to obtain a foam-like character. While a nonwoven of two-dimensionally crimped fibers consist of at least 20% fibers aligned at a right angle to the surface as described in EP 763418, and contains binding fibers and is soft but during compression does not exhibit any noticeable resistance, i.e., a cushion effect, until after approx. two-thirds of the distance; the nonwoven according to the

invention of spiral-crimped fibers has a noticeable resistance already after maximum 20% of the deformation distance, but without seeming hard. This characteristic is very similar to that of foam. In addition, the spiral-crimped fiber causes a better dynamic recovery rate, even after repeated stress, than known padding materials with conventional 2-D crimped fibers. This effect could be explained in that the spiral-crimped fibers are present as three-dimensional ball-like assemblies in the nonwoven and not in a flat or vector-shaped alignment as in two-dimensionally crimped fibers.

These advantages lead to the fact that the material density, and thus also the basis weight, can be reduced by at least 15%, but usually at least 20-50% in comparison to the padding materials of the usual fibers.

For cost reasons, the spiral-crimped bicomponent shrink fibers mentioned above can be partially replaced with previously fixed crimped fibers or by conventional, two-dimensionally crimped fibers, but also by fibers of other polymers or by natural fibers. However, a minimum percentage of approx. 10 weight-% of spiral-crimped bicomponent shrink fibers in the nonwoven is necessary.

Fixed spiral-crimped fibers of this type can be obtained, for example, under the name Dacron T88 from

DuPont de Nemours, Wilmington. Trevira, type 290 from Trevira GmbH can be mentioned as an example of a two-dimensionally crimped fiber.

A significant component of the padding material according to the invention is the binding fiber in a weight ratio to the nonwoven of 5%-50%, preferably 5%-30%. Fastening with the widely-used amorphous bicomponent fibers consisting of a crystalline PET core and an amorphous shroud of a copolymer of terephthalic acid and isophthalic acid and glycol (models Melty 4080, Melty 3380, Melty 2080, all from Unitika Ltd. Osaka) had the disadvantage that, even with these amorphous types, the melting points cannot be defined clearly and the softening of the fibers already starts at 70°C (glass transition temperature and/or in this case: relaxation temperature). A continuous increase in the temperature above this glass temperature of 70°C results in a continuous lowering of the heat stability of the nonwoven and would make it unsuitable for use in the automotive area. In addition, at the usual shrinkage temperatures of spiral-crimped bicomponent shrink fibers of 160 to 190°C, the amorphous fusing mantel liquefies in such a way that the melt lies closed around the spiral-crimped bicomponent shrink fibers and the majority of their positive properties would be neutralized.

According to the invention, the problem is solved in that for bonding, a shroud/core fiber of crystalline polyester (shroud) and crystalline polyester (core) would be mixed with the nonwoven. These fusing fibers, e.g., of the type Melty 7080 (Unitika Ltd. Osaka) exhibit a sharply defined melting point and a significantly higher binding power than the above mentioned amorphous binding fibers. Fibers of this type exhibit a sharp melting point of the shroud at approx. 160°C, measured by DSC analysis, whereby there is no fear of significant fusing of the melt shroud polymer.

The suggested binding fiber additionally reinforces the rebound force of the nonwoven and causes good heat resistance according to the requirements of the automotive industry.

The nonwoven according to the invention can be produced in basis weights of 60 to 700 g/m$^2$, but preferably from 80 to 300 g/m$^2$; the thicknesses measured according to DIN 53855 part 1 are adjustable and are usually between 1 mm and 15 mm and preferably between 2 mm and 7 mm.

The fiber thicknesses and lengths used can vary greatly, the titer and staple mentioned as an example will therefore have no limiting effect. For the spiral-crimped shrink fibers, fiber thicknesses of 0.9 to 30 dtex are

usual and preferably 1.7 to 12 dtex, for the binding fiber 1.7 to 17 dtex and preferably 3.3 to 12 dtex, for the fixed spiral-crimped fibers and the two-dimensionally crimped fibers mentioned 0.9 dtex to 30 dtex and preferably 1.7 to 12 dtex. The staple length depends on the nonwoven manufacturing process used and varies in the range from about 20 mm to 150 mm.

It is understood that the nonwoven can also be further finished, in that a heat activated adhesive layer is applied, especially on one side.

Explanations of the Drawings

Fig. 1 schematically shows a common two-dimensionally crimped (zigzag) fiber

Figs. 2a and 2b show spiral-crimped fibers, whereby Fig. 2a shows the fibers in raw state and

Fig. 2b shows the fibers in thermally treated state.

Fig. 3 schematically shows the structure of a padded material, whereby (1) represents the decorative layer, (2) the adhesive layer and (3) the padding material according to the invention.

Embodiment Example

A fiber mixture of

20% fusing fibers Melty 7080 (Unitika Ltd Osaka) 5.3 dtex

50 mm

30% spiral-crimped shrink fiber Tergal X 403 3.3 dtex

50% Trevira 290 5.7 dtex/60 mm Hoechst/Trevira GmbH

was produced, a formed fabric was created on a carding machine and adjusted to a weight of 125 g/m$^3$ by means of nonwoven lapping. Then the layers were needled from top and bottom and fastened and fixed in a thermofusion oven at 180°C. The final material thickness of 3 mm is adjusted using calibration rollers. Then the product is intermediate-wound and supplied to the laminating unit for laminating with the decorative material. Lamination is carried out using spread and melted polyester powder.

The article obtained has a visually flawless surface, good padding effect, as well as no tendency to form folds.

Patent Claims

1. Padding for decorative and/or covering material consisting of a needle nonwoven of textile fibers, characterized in that the textile fibers consist of a fiber mixture, the components of which consist of a) 10%-95% of a polyester fiber forming a spiral crimp, b) 5 weight-% - 50 weight-% of a shroud-core bicomponent fiber and c) 0%-85% of a filler fiber mixture.

2. Padding according to Claim 1, characterized in that the shroud-core bicomponent fibers consists of crystalline

polyester (shroud) and crystalline polyester (core).

3. Padding according to Claim 1, characterized in that the shroud of the shroud-core binding fiber has a melting point of 140°C or more.

4. Padding according to Claim 1, characterized in that the polyester fiber forming a spiral-crimped consists of a polyester shrink fiber.

5. Padding according to Claims 1 and 4, characterized in that the polyester fiber forming a spiral-crimped has a bicomponent fiber with side-by-side arrangement of the two polymers.

6. Padding according to Claim 1, characterized in that the filler fiber mixture consists of spiral crimp, fixed polyester fibers and/or of two-dimensionally crimped fibers.

7. Padding according to Claims 1 and 6, characterized in that the two-dimensionally crimped fibers are natural fibers or synthetic fibers of natural polymers, preferably viscose fibers.

8. Padding according to Claims 1 and 6, characterized in that the two-dimensionally crimped fibers are synthetic fibers.

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1 page of figures attached.
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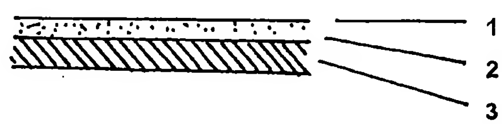
Figur 1

Figur 2 a

Figur 2 b




Figur 3



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